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(54) DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a display device having the light emitting surfaces which are superior in the uniformity of the surface, low in the reduction of the brightness and have no dark sections nor line irregularities.
SOLUTION: The device is provided with a light source 31 and a display section 39 which is connected to the source 31 and displays the graphics and the characters to be recognized. The section 39 consists of light transmission bodies 32 in which at least one end face is facing to the source 31 and is made as a light incident plane and the other main surface is roughened and is made as a light emitting-surface, a light deflecting sheet 33 which is placed on the other main surface side and a display board 34 which is placed outside the sheet 33 and on which the graphics to be recognized are formed. Each of the bodies 32 has plural small light transmission bodies 32a arranged on the same surface. These bodies 32a,... are pressed by elastic members 36,... from the external so that the end faces of the adjacent bodies 32a are pushed together and held.

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CLAIMS

[Claim(s)]

[Claim 1] It has the light source and the indicator which displays the graphic form or alphabetic character which connects with this light source and should be recognized. This indicator The transparent material by which considered as the optical plane of incidence to which an end side counters said light source at least, and surface roughening of one principal plane was carried out, and it was made the optical outgoing radiation side, It consists of an optical turning sheet arranged at one [this] principal plane side, and a container reference plate with which the graphic form which it is arranged on the outside of this optical turning sheet, and should be recognized was formed. Said transparent material It is display equipment characterized by two or more small transparent materials being arranged on one field, and coming to hold these smallness transparent material where the end faces of the small transparent material which is pressed by the elastic member from the method of outside, and adjoins are compared.

[Claim 2] Said optical turning sheet is display equipment according to claim 1 characterized by coming to join the end faces of two or more small light turning sheets through a transparence member.

[Claim 3] Said transparent material is display equipment according to claim 1 which an end side is made into a mirror plane at least, and is characterized by coming to stick the reflective film on this end face.

[Claim 4] Display equipment according to claim 1 characterized by preparing the reflector which is made to reflect the light which carries out outgoing radiation to the

principal plane side of another side of said transparent material from this transparent material, and is again returned to this transparent material.
[Claim 5] Said transparent material is display equipment according to claim 1 which is made into the crepe side where one [said] principal plane has the concave convex whose average tilt angle (thetaa) is 0.5-25 degrees, and is characterized by whenever [variation / in the brightness] (R %) being 450% or less.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is used suitable for various guidance container reference plates, large-sized signboards, etc. in a guide sign, a station, a public facility, etc. in a highway or an ordinary road, and relates to display equipment with the uniform luminance distribution in an optical outgoing radiation side.
[0002]
[Description of the Prior Art] Conventionally, in the guide sign used on the highway etc., in order to raise the visibility of Nighttime, and readability, two lighting methods called an interior lighting method and an exterior lighting method are adopted. An interior lighting method forms an alphabetic character and a graphic form in translucent plastic sheets, such as an methacrylic plate, by a clipping or printing, uses them as a container reference plate, arranges the light source which serves as a back light inside this container reference plate, and illuminates said container reference plate according to this light source. As the light source, the fluorescent lamp of a straight pipe form or an annulus is used. On the other hand, an exterior lighting method arranges the light source to the upper part by the side of the front face of the container reference plate in which the contents of a display were formed, a lower part, the side, etc., and illuminates the front face of said container reference plate according to this light source. As the light source, the fluorescent lamp of a straight pipe form is used and the rate fluorescent lamp of super-high tensile of 110W is used especially on a highway etc. in many cases.
[0003] by the way, the ratio of die-length L and thickness t between the end side of a transparent material, and an other end side -- in large-sized display equipment with which L/t becomes 50 or more, it is rather difficult for the breadth of the luminance distribution on a field to become very large, and to make breadth of luminance distribution small in the present condition. When an exterior lighting method was used especially, there was a trouble that the luminance distribution on the field of the container reference plate in large-sized display equipment will become very large.

Then, the following display equipments are proposed by this invention person etc. (for example, refer to Japanese Patent Application No. No. 203486 [seven to]).
[0004] Drawing 7 is the outline block diagram of this display equipment, drawing 8 is a said division part perspective view, and the metal halide lamp (light source) with which a sign 1 outputs high brightness light, the optical fibers 3 and 3 of plurality [2], the multicore optical cable which twisted --, the indicator by which 4 was connected to the multicore optical cable 2, and 5 are connections which make connection between the multicore optical cable 2 and an indicator 4 in drawing. The transparent material 11 which an indicator 4 is constituted by the acrylic board, and outgoing radiation edge 3a of an optical fiber 3 is connected to end side 11a, and carries out outgoing radiation of the light from one principal plane 11b by which surface roughening was carried out, The prism sheet 12 arranged at the 1 principal-plane 11b side of a transparent material 11, and **** 13 over which it is arranged on the outside of the prism sheet 12, and a part of transmitted light is scattered, The container reference plate 14 with which the graphic form which it is arranged on the outside of **** 13 and should be recognized was formed, It is constituted by the reflective film (reflector) 15 which is made to reflect the light which it is prepared in other 1 principal-plane 11c side of a transparent material 11, and carries out outgoing radiation from a transparent material 11, and is again returned to this transparent material 11, and the backing 16 which is formed in the outside of the reflective film 15 and consists of an acrylic board. And a bolt 17 connects and these transparent materials 11 - backing 16 are unified.
[0005] Also in the thin large-sized display equipment with which L/t becomes 50 or more light with directivity strong with this display equipment -- the inside of a transparent material 11 -- spreading -- the ratio of end side 11a of a transparent material 11, die-length L, and thickness t between 11d of other end sides -- Luminance distribution within the field of 1 principal-plane 11b of a transparent material 11 can be mostly made into homogeneity, it is large-sized and display equipment excellent in visibility can be offered.
[0006]
[Problem(s) to be Solved by the Invention] By the way, with the display equipment mentioned above, enlargement of display equipment cannot be performed more than the magnitude of a transparent material 11, and there was a limit in the enlargement. Then, although how to make it into the transparent material of one sheet unified by joining with adhesives the end faces of the small transparent material of the standard size size arranged on one field as an approach of enlarging a transparent material 11 can be considered In this case, in order that light may leak from a part for this joint slightly, the brightness in a part for this joint will differ from the brightness of a transparent material, and there is a possibility that the homogeneity of field luminescence may be spoiled. Moreover, although how to compare the end faces of these small transparent materials, and fix, without using adhesives is also considered,

since a possibility that deformation resulting from these flexible differences may arise is between the transparent material itself and the case holding this transparent material in this case, it is necessary to establish a clearance in this comparison part, and when especially brightness is high, there is a possibility that the umbra which originates in a luminescence side in this clearance may arise periodically. Moreover, since processing is not made at all, light tends to leak, the quantity of light of the outgoing radiation light from a luminescence side to the quantity of light of the incident light which carries out incidence to this transparent material 11 decreases, and the end face of said transparent material 11 has the trouble that the brightness of this luminescence side falls.

[0007] While being made in view of the above-mentioned situation and excelling in the homogeneity within a field, the fall of brightness is small, and this invention aims at offering the display equipment which has a luminescence side without a possibility that an umbra and stripe nonuniformity may moreover arise.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention adopted the following display equipments. Display equipment according to claim 1 is equipped with the light source and the indicator which displays the graphic form or alphabetic character which connects with this light source and should be recognized. Namely, this indicator The transparent material by which considered as the optical plane of incidence to which an end side counters said light source at least, and surface roughening of one principal plane was carried out, and it was made the optical outgoing radiation side, It is what consists of an optical turning sheet arranged at one [this] principal plane side, and a container reference plate with which the graphic form which it is arranged on the outside of this optical turning sheet, and should be recognized was formed. Said transparent material Two or more small transparent materials are arranged on one field, and where the end faces of the small transparent material which presses these smallness transparent material from the method of outside by the elastic member, and adjoins are compared, it holds.

[0009] With this display equipment, incidence of the light which carries out outgoing radiation from the light source is carried out to the transparent material in an indicator from that end side, and it spreads the inside of this transparent material toward an other end side, and it carries out outgoing radiation at an angle of predetermined toward the exterior from one principal plane of a transparent material. Here, it will spread by guiding the light from the light source into a transparent material, a strong directive light decreasing the inside of a transparent material slightly toward an other end side from the end side. That optical path is corrected in the direction of arbitration by the optical turning sheet to one [said] principal plane, and this light passes a container reference plate.

[0010] Here, said small transparent materials will be held where the end faces are always compared, and its a possibility that deformation and a clearance may be

generated between between these smallness transparent materials, a small transparent material, and the case holding this small transparent material disappears. A possibility that the umbra which originates in a luminescence side in this deformation or a clearance may arise by this disappears, and the homogeneity within a field of brightness improves.

[0011] Display equipment according to claim 2 joins the end faces of two or more small light turning sheets for said optical turning sheet through a transparence member. With this display equipment, while junction of the end faces of a small light turning sheet becomes firm, the falls of the brightness by the transparence member for this joint are also few, and the homogeneity within a field of brightness does not fall.

[0012] Display equipment according to claim 3 makes a mirror plane at least 1 end face of said transparent material, and sticks the reflective film on this end face. With this display equipment, since the reflection factor of the light in the end side of said transparent material increases, the brightness in a luminescence side improves. It becomes possible to enlarge a transparent material, without reducing brightness by this, when the same light source is used.

[0013] Display equipment according to claim 4 prepares the reflector which is made to reflect the light which carries out outgoing radiation to the principal plane side of another side of said transparent material from this transparent material, and is again returned to this transparent material. With this display equipment, the luminous intensity which carries out outgoing radiation from one principal plane of this transparent material becomes strong.

[0014] Display equipment according to claim 5 is made into the crepe side which has the concave convex whose average tilt angle (thetaa) is 0.5–25 degrees about one principal plane of said transparent material, and makes whenever [variation / in the brightness] (R %) 450% or less. With this display equipment, the homogeneity within a field of brightness improves and the luminance distribution in an optical outgoing radiation side becomes homogeneity.

[0015]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of the display equipment concerning this invention is explained based on a drawing. the part drawing 1 indicates the display equipment of 1 operation gestalt of this invention to be -- a fracture top view and drawing 2 are these drawings of longitudinal section. The transparent material by which considered as the optical plane of incidence to which, as for a sign 31, an end side counters the light source, and 32 counters the light source 31 at least in drawing, and surface roughening of the front face (one principal plane) was carried out, and it was made the optical outgoing radiation side, The optical turning sheet with which 33 has been arranged at the front-face (one principal plane) side of a transparent material 32, The container reference plate with which the graphic form which 34 is arranged on the outside of the optical turning sheet 33, and should be

recognized was formed, The reflecting plate which is made to reflect the light which 35 is prepared in the rear-face (principal plane of another side) side of a transparent material 32, and carries out outgoing radiation from this transparent material 32, and is again returned to this transparent material 32 (reflector), The compression spring to which 36 presses a transparent material 32 from the method of the outside of the direction of the field (elastic member), The presser-foot plate which 37 is prepared between a transparent material 32 and a compression spring 36, and presses down this transparent material 32, and 38 are housing (case), and the indicator 39 is constituted by the transparent material 32, the optical turning sheet 33, the container reference plate 34, and the reflective film 35.

[0016] Although the fluorescent lamp of the straight pipe mold generally used is suitably used as the light source 31, when it is necessary to intercept traffic like a highway and exchange of the light source 31 needs to be performed, the Rhine light which has arranged two or more optical fibers to juxtaposition may be used.

[0017] A transparent material 32 arranges small transparent material 32a of plurality (this operation gestalt six sheets), and -- in all directions on a horizontal plane, presses down these smallness transparent material 32a and --, presses them from the method of outside by the compression spring 36 and -- through a plate 37 and --, and where [of small transparent material 32a and --] end faces are compared, it is held.

[0018] Small transparent material 32a and -- are made into the crepe side which it considers as the optical plane of incidence to which an end side counters a fluorescent lamp 31, and surface roughening of the front face (one principal plane) is carried out, and has the concave convex whose average tilt angle (thetaa) is 0.5-25 degrees, and whenever [variation / in brightness] (R %) is made into 450% or less of optical outgoing radiation side for this crepe side. As for this small transparent material 32a and --, transparence plates, such as glass and synthetic resin, are used suitably. As said synthetic resin, the resin of high transparency, such as acrylic resin, polycarbonate system resin, and vinyl chloride system resin, is suitable, for example. The methacrylic resin which uses especially a methyl methacrylate as a principal component among these resin is excellent in the point of the height of permeability, thermal resistance, kinetic property, and fabrication nature.

[0019] As the formation approach of a split face, a split face is formed by spraying particles, such as a glass bead, for example, or there is a method of processing direct small transparent material 32a by the approach and blasting to which the concavo-convex matter is made to apply or adhere by the approach of imprinting a split face by hot press etc., print processes, etc., the etching method, etc. using glass [which performed chemical etching which used fluoric acid further], and a metal mold.

[0020] As this transparent material 32 is shown in drawing 3 , by performing mirror plane processing of buffing etc. to the end face 41 of three directions except the end face which counters the light source 31, surface roughness is made into the mirror

plane beyond 8S, uses adhesives etc. for these end faces 41, and the reflective ribbon-like film (reflective film) 42 is stuck. In this transparent material 32, since surface roughness made the end face 41 the mirror plane beyond 8S and the reflective film 42 was stuck on these end faces 41, the reflection factor of the light in an end face 41 increases, and the brightness in a luminescence side improves. It is possible to enlarge a transparent material 32, without reducing brightness by this, when the same light source is used.

[0021] In this case, if the reflective film 42 is stuck on the end face 41 with a split face If the reflective film 42 is not stuck the luminescence side brightness of the end-face 41 circumference becoming high, and the homogeneity of the brightness of the whole luminescence side being missing, and making an end face 41 into a mirror plane Light leaks from an end face 41 and it becomes [that the quantity of light is spoiled with as, and], and also the light from an end face 41 will be too bright, and it will be necessary to cover a periphery anew, and is inconvenient.

[0022] The optical turning sheet 33 is for carrying out turning of the direction of outgoing radiation of the light from a transparent material 32 in the specific directions, such as for example, the direction of a normal, and consists of acrylic resin, polycarbonate resin, activity energy-line hardening mold resin, etc., and optical elements to which turning of the course of light is carried out optically, such as a diffusion sheet besides the prism sheet with which many prism trains were formed in parallel, and were made into the prism side on the surface of the sheet, and a lenticular lens sheet, are used suitably.

[0023] Like said transparent material 32, the optical turning sheet 33 arranges two or more small light turning sheets 33a and 33a in all directions on a horizontal plane, as shown in drawing 4 . The flat sides of the small light turning sheets 33a and 33a are joined by comparing the end faces of these small light turning sheets 33a and 33a, and sticking the transparence doubling plate (transparence member) 45 on this comparison section through the transparence adhesives 44. This optical turning sheet 33 is good also as a configuration which stuck the bright film 47 with a binder (transparence member) on the comparison section, as shown, others, for example, drawing 5 . [configuration / above-mentioned] With this configuration, since the thickness of the bright film 47 with a binder is thin, compared with the case where said transparence doubling plate 45 is used, it can be made a flat. Moreover, the bright film 47 with a binder has the desirable bright film which consists of a vinyl chloride with weatherability etc.

[0024] An optical path is corrected in the direction of arbitration for the light which has the directivity of about 50-80 degrees from the front face of a transparent material 32 with this optical turning sheet 33 to the normal which carried out outgoing radiation. In this case, in display equipments, such as a highway, although it changes with purposes of using display equipment, it is corrected so that it may become the include angle of about 3-7 degrees in general downward to the normal of the front

face of a transparent material 32. That by which aluminum film, Ag film, etc. were vapor-deposited in the state of the laminating is suitably used for the front face of the sheet-like sheet metal with which a reflecting plate 35 consists of polyethylene terephthalate (PET) resin etc.

[0025] Here, the optical refraction and reflection in the crepe side which has the concave convex of a transparent material 32 are explained. As shown in drawing 6 , the front face of the transparent material 32 of a refractive index n is made into the crepe side 51 which consists of a concavo-convex inclined plane, incidence is carried out to the crepe side 51 by the incident angle i to which Light A exceeds a critical angle from the transparent material 32 of a refractive index n, and the case where outgoing radiation is carried out is considered by outgoing radiation angle i' in the air of refractive-index ni' (= 1).

[0026] The light A which carried out incidence to the crepe side 51 is a Snell's law (Snell's law). n-n/ni'=sin(i')/sin (i) .... (1)

Outgoing radiation is carried out to a way outside a transparent material 32 by outgoing radiation angle i' to satisfy. On the other hand, it reflects by include-angle k' (k'=k) in respect of [51] crepe, and the light B which carried out incidence by the incident angle k within a critical angle spreads the inside of a transparent material 32. Since an incident angle becomes sharp in case incidence is again carried out to the crepe side 51, the light reflected by the crepe side 51 becomes easy to exceed a critical angle, and it once becomes easy to carry out outgoing radiation to a way outside a transparent material 32.

[0027] In this display equipment, it is experimentally found out by this invention person etc. that the relation between the outgoing radiation reinforcement (I) of the light in a certain point and the outgoing radiation reinforcement (I0) in an optical plane-of-incidence edge is expressed by the formula (2) using the rate (alpha) of outgoing radiation, the distance (L') from optical outgoing radiation ****, and the thickness (t) of a transparent material.

I=I0(1-alpha/100) L'/t .... (2)

(1) A formula shows that the homogeneity of the brightness within an optical outgoing radiation side is determined with the rate (alpha) of outgoing radiation, if the die length (L) and thickness (t) of a transparent material 32 are determined.

[0028] In addition, the rate (alpha) of outgoing radiation of the transparent material 32 of thickness tmm can measure brightness at intervals of 20mm from the optical plane-of-incidence edge of a transparent material 32, can search for that inclination (K (mm-1)) from the relation between the logarithm of this brightness, and the distance from an optical plane-of-incidence edge, and can search for it by substituting this inclination (K) for the following (3) types.

alpha=(1-10K) x100 .... (3)

[0029] In this display equipment, whenever [variation] (R %) is used as a homogeneous scale of luminance distribution. Whenever [variation] (R %) can

measure the brightness of within the limits to the edge which counters from the point of a transparent material 32 which is mostly distant from an optical plane-of-incidence edge 20mm in a center section at intervals of 20mm, can calculate the maximum (Imax) of these brightness, the minimum value (Imin), and the average (Iav), and can calculate them by assigning these values to the following (4) types.
R%={(Imax-Imin) /Iav} x100 .... (4)
[0030] As for the rate (alpha) of outgoing radiation of a transparent material 32, and whenever [variation] (R %), above shows having a specific relation depending on the die length (L) and thickness (t) of a transparent material 32. For example, if the rate (alpha) of outgoing radiation becomes large, also whenever [variation] (R %) will increase as also whenever [variation] (R %) increases in connection with it, and the die length (L) of a transparent material 32 and the ratio (L/t) of thickness (t) will become large, if the rate (alpha) of outgoing radiation is fixed. That is, in the transparent material 32 of fixed magnitude, the homogeneity (whenever [variation]) of the luminance distribution in the optical outgoing radiation side of a transparent material 32 can plan homogeneity of luminance distribution by controlling the rate (alpha) of outgoing radiation depending on the rate (alpha) of outgoing radiation from a transparent material 32.
[0031] Moreover, if the crepe side 51 of a transparent material 32 is made into the slant face which has one inclination in approximation, the direction of outgoing radiation and the rate of outgoing radiation of light which carry out outgoing radiation will change from a transparent material 32 depending on the inclination of this irregularity. Said inclination can be expressed using the average tilt angle (thetaa) specified to ISO4287 / 1-1987. If an average tilt angle (thetaa) becomes large, it will serve as outgoing radiation light with which the outgoing radiation angle approached in the direction of a normal by becoming small, and in connection with it, as for the outgoing radiation light from a transparent material 32, the rate of outgoing radiation from a transparent material 32 also becomes high. Therefore, by making low the rate of outgoing radiation from a transparent material 32, the homogeneity of the illumination distribution in the optical outgoing radiation side of this transparent material 32 can be raised, and if an average tilt angle (thetaa) is made small, equalization can be attained.
[0032] If whenever [variation / in the brightness of the crepe side of the front face of a transparent material 32] (R %) is 450% or less when using this display equipment in a guide sign, a traffic sign, etc. in a highway or an ordinary road, the homogeneity of the luminance distribution demanded can be satisfied. For that, it is required to make preferably 0.5-25 degrees (thetaa) of average tilt angles of said crepe side into 0.5-7.5 degrees. The reason is that it becomes impossible that it turns this outgoing radiation light in the direction of a normal enough even if the outgoing radiation angle of the outgoing radiation light from an optical outgoing radiation side becomes it large that an average tilt angle (thetaa) is less than 0.5 degrees and it uses the optical

turning sheet 33, and is because the homogeneity of luminance distribution will be spoiled on the other hand if an average tilt angle (thetaa) exceeds 25 degrees.
[0033] As explained above, according to the display equipment of this operation gestalt, a transparent material 32 Since it considered as the configuration which arranges two or more small transparent material 32a and -- in all directions on a horizontal plane, presses down these smallness transparent material 32a and --, presses from the method of outside by the compression spring 36 and -- through a plate 37 and --, and is held where [of small transparent material 32a and --] end faces are compared Small transparent material 32a and -- can be held where the end faces are always compared, and it can prevent that deformation and a clearance are generated between the housing 38 holding these smallness transparent material 32a, between -- and small transparent material 32a, and this small transparent material 32a. Therefore, there is no possibility that the umbra which originates in a luminescence side in this deformation or a clearance may arise, and the homogeneity within a field of brightness can be raised. And by arranging small transparent material 32a and -- in all directions on a horizontal plane, implementation of the surface light source component of a large area is attained, and it is effective in the degree of freedom of a design increasing.
[0034] Since the end faces of the small light turning sheets 33a and 33a were compared and the transparence doubling plate 45 or the bright film 47 with a binder was stuck on this comparison section, junction of end faces can be strengthened and, moreover, the homogeneity within a field of brightness does not fall. Moreover, since structure is easy, it can manufacture easily.
[0035] Moreover, since surface roughness made the end face 41 of a transparent material 32 the mirror plane beyond 8S and the reflective film 42 was stuck on these end faces 41, the reflection factor of the light in an end face 41 can be raised, and the brightness in a luminescence side can be raised. Therefore, a transparent material 32 can be enlarged, without reducing brightness.
[0036] Moreover, since the reflecting plate 35 was formed in the rear-face side of a transparent material 32, the light which carries out outgoing radiation from this transparent material 32 with this reflecting plate 35 can be reflected, it can return to this transparent material 32 again, and the optical reinforcement of the outgoing radiation light of this transparent material 32 can be increased.
[0037] Moreover, since it considered as the crepe side which has the concave convex whose average tilt angle (thetaa) is 0.5-25 degrees about the front face of a transparent material 32 and whenever [variation / in the brightness] (R %) was made into 450% or less, the homogeneity within a field of brightness can be raised and luminance distribution in an optical outgoing radiation side can be made into homogeneity.
[0038]
[Effect of the Invention] According to the display equipment of this invention

according to claim 1, to the appearance explained above said transparent material Since it considered as the configuration held where the end faces of the small transparent material which arranges two or more small transparent materials on one field, presses these smallness transparent material from the method of outside by the elastic member, and adjoins are compared Small transparent materials can be held where the end faces are always compared, and it can prevent that deformation and a clearance are generated between between these smallness transparent materials, a small transparent material, and the case holding this small transparent material. Therefore, there is no possibility that the umbra which originates in a luminescence side in this deformation or a clearance may arise, and the homogeneity within a field of brightness can be raised.

[0039] According to display equipment according to claim 2, since the end faces of two or more small light turning sheets were joined for said optical turning sheet through the transparence member, junction of end faces can be strengthened and, moreover, the homogeneity within a field of brightness does not fall.

[0040] According to display equipment according to claim 3, the reflection factor of the light in an end face since the end side was made into the mirror plane at least and the reflective film was stuck on this end face of said transparent material can be raised, and the brightness in a luminescence side can be raised. Therefore, a transparent material can be enlarged, without reducing brightness.

[0041] Since the reflector which is made to reflect the light which carries out outgoing radiation to the principal plane side of another side of said transparent material from this transparent material, and is again returned to this transparent material was prepared according to display equipment according to claim 4, the light which carries out outgoing radiation from this transparent material by this reflector can be reflected, it can return to this transparent material again, and the optical reinforcement of the outgoing radiation light of this transparent material can be increased.

[0042] Since according to display equipment according to claim 5 it considered as the crepe side which has the concave convex whose average tilt angle (thetaa) is 0.5–25 degrees about one principal plane of said transparent material and whenever [variation / in the brightness] (R %) was made into 450% or less, the homogeneity within a field of brightness can be raised and luminance distribution in an optical outgoing radiation side can be made into homogeneity.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] the display equipment of 1 operation gestalt of this invention is shown -- it is a fracture top view a part.
[Drawing 2] It is drawing of longitudinal section showing the display equipment of 1 operation gestalt of this invention.
[Drawing 3] It is the decomposition perspective view showing the configuration of the transparent material of the display equipment of 1 operation gestalt of this invention.
[Drawing 4] It is drawing showing the junction structure of the small light turning sheet of the display equipment of 1 operation gestalt of this invention, and this drawing (a) is a top view and this drawing (b) is a side elevation.
[Drawing 5] It is drawing showing other junction structures of the small light turning sheet of the display equipment of 1 operation gestalt of this invention, and this drawing (a) is a top view and this drawing (b) is a side elevation.
[Drawing 6] It is the mimetic diagram showing the optical path in the split face of the transparent material of the display equipment of 1 operation gestalt of this invention.
[Drawing 7] It is the outline block diagram showing conventional display equipment.
[Drawing 8] It is the partial perspective view showing conventional display equipment.
[Description of Notations]
31 Light Source
32 Transparent Material
32a Small transparent material
33 Optical Turning Sheet
33a Small light turning sheet
34 Container Reference Plate
35 Reflecting Plate (Reflector)
36 Compression Spring (Elastic Member)
37 Presser-Foot Plate
38 Housing (Case)
39 Indicator
41 End Face
42 Reflective Film (Reflective Film)
44 Transparence Adhesives
45 Transparence Doubling Plate (Transparence Member)
47 Bright Film with Binder (Transparence Member)
51 Crepe Side

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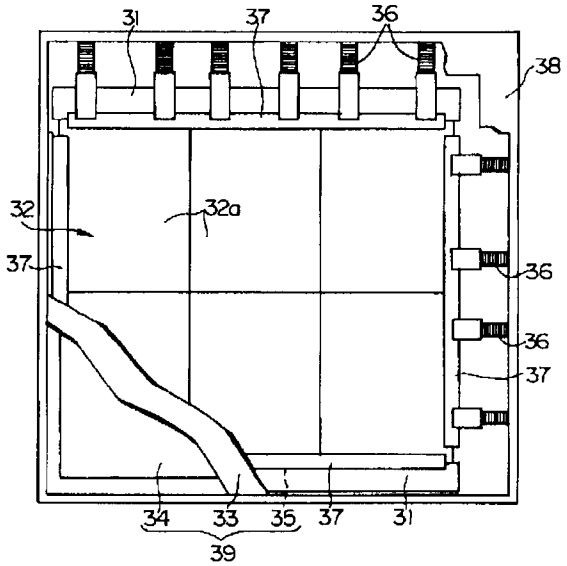
最終頁に続く

(54)【発明の名称】　標示装置

(57)【要約】

【課題】　面内均一性に優れるとともに輝度の低下が小さく、しかも暗部やスジムラが生じるおそれのない発光面を有する標示装置を提供する。

【解決手段】　光源３１と、光源３１に接続されて認識すべき図形または文字を標示する標示部３９とを備え、標示部３９は、少なくとも一端面が光源３１に対向する光入射面とされかつ一方の主面が粗面処理されて光出射面とされた導光体３２と、一方の主面側に配置された光変向シート３３と、光変向シート３３の外側に配置され認識すべき図形が形成された標示板３４とからなり、導光体３２は、複数の小導光体３２ａが一つの面上に配列され、これら小導光体３２ａ，…は弾性部材３６，…により外方から押圧されて隣接する小導光体３２ａ，…の端面同士が突き合わせられた状態で保持されてなることを特徴とする。



【特許請求の範囲】
【請求項１】　光源と、
該光源に接続されて認識すべき図形または文字を標示する標示部とを備え、
該標示部は、少なくとも一端面が前記光源に対向する光入射面とされかつ一方の主面が粗面処理されて光出射面とされた導光体と、該一方の主面側に配置された光変向シートと、該光変向シートの外側に配置され認識すべき図形が形成された標示板とからなり、
前記導光体は、複数の小導光体が一つの面上に配列され、これら小導光体は、弾性部材により外方から押圧されて隣接する小導光体の端面同士が突き合わせられた状態で保持されてなることを特徴とする標示装置。
【請求項２】　前記光変向シートは、複数の小光変向シートの端面同士が透明部材を介して接合されてなることを特徴とする請求項１記載の標示装置。
【請求項３】　前記導光体は、少なくとも一端面が鏡面とされかつ該端面に反射膜が貼設されてなることを特徴とする請求項１記載の標示装置。
【請求項４】　前記導光体の他方の主面側に、該導光体から出射する光を反射させて再度該導光体に戻す反射体を設けたことを特徴とする請求項１記載の標示装置。
【請求項５】　前記導光体は、前記一方の主面が平均傾斜角（θ_a）が０．５～２５°の凹凸面を有する梨地面とされ、かつその輝度のバラツキ度（Ｒ%）が４５０%以下であることを特徴とする請求項１記載の標示装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、高速道路や一般道路における種々の案内標識、駅や公共施設等における案内標示板や大型看板等に好適に用いられ、光出射面内での輝度分布が均一な標示装置に関するものである。
【０００２】
【従来の技術】従来、高速道路等で用いられている案内標識においては、夜間の視認性、判読性を高めるために、内部照明方式と外部照明方式という２つの照明方式が採用されている。内部照明方式は、メタクリル板等の半透明のプラスチック板に切抜きまたは印刷等により文字や図形を形成して標示板とし、この標示板の内側にバックライトとなる光源を配置し、該光源により前記標示板を照らすようにしたものである。光源としては、直管形または環形の蛍光灯が用いられている。一方、外部照明方式は、表示内容を形成した標示板の前面側の上方、下方、側方等に光源を配置し、該光源により前記標示板の前面を照らすようにしたものである。光源としては、直管形の蛍光灯が用いられており、特に高速道路等においては１１０Ｗの超高力率蛍光灯が用いられることが多い。
【０００３】ところで、導光体の一端面と他端面との間の長さＬとその厚みｔとの比Ｌ／ｔが５０以上となるような大型の標示装置においては、面上の輝度分布の広がりが非常に大きくなり、現状では輝度分布の広がりを小さくすることはなかなか難しい。特に、外部照明方式を用いた場合には、大型標示装置における標示板の面上の輝度分布が非常に大きくなってしまうという問題点があった。そこで、本発明者等により、次の様な標示装置が提案されている（例えば、特願平７－２０３４８６号参照）。
【０００４】図７は該標示装置の概略構成図、図８は同部分斜視図であり、図において、符号１は高輝度光を出力するメタルハライドランプ（光源）、２は複数の光ファイバ３，３，…を撚り合わせた多芯光ケーブル、４は多芯光ケーブル２に接続された標示部、５は多芯光ケーブル２と標示部４との接続を行う接続部である。標示部４は、アクリル板により構成され、一端面１１ａに光ファイバ３の出射端３ａが接続され、粗面処理された一主面１１ｂから光を出射する導光体１１と、導光体１１の一主面１１ｂ側に配置されたプリズムシート１２と、プリズムシート１２の外側に配置され透過光の一部を散乱させる乳板１３と、乳板１３の外側に配置され認識すべき図形が形成された標示板１４と、導光体１１の他の一主面１１ｃ側に設けられ導光体１１から出射する光を反射させて再度該導光体１１に戻す反射フィルム（反射体）１５と、反射フィルム１５の外側に設けられアクリル板からなる裏板１６とにより構成されている。そして、これら導光体１１～裏板１６は、ボルト１７により接続され一体化されている。
【０００５】この標示装置では、指向性の強い光が導光体１１中を伝搬し、導光体１１の一端面１１ａと他端面１１ｄとの間の長さＬとその厚みｔとの比Ｌ／ｔが５０以上となる大型で薄型の標示装置においても、導光体１１の一主面１１ｂの面内における輝度分布をほぼ均一にすることができ、大型で視認性に優れた標示装置を提供することができる。
【０００６】
【発明が解決しようとする課題】ところで、上述した標示装置では、標示装置の大型化は導光体１１の大きさ以上にはできないものであり、その大型化には限度があった。そこで、導光体１１を大型化する方法として、一つの面上に配列された定尺サイズの小導光体の端面同士を接着剤で接合して一体化された一枚の導光体とする方法が考えられるが、この場合、僅かながらこの接合部分から光が洩れるために該接合部分における輝度が導光体の輝度と異なることとなり、面発光の均一性が損なわれるおそれがある。また、接着剤を用いずにこれらの小導光体の端面同士を突き合わせて固定する方法も考えられるが、この場合、導光体自体と該導光体を保持する筐体との間にこれらの伸縮差に起因する変形が生じるおそれがあるためにこの突き合わせ部分に隙間を設ける必要があり、特に輝度が高い場合、発光面に該隙間に起因する暗

部が周期的に生じるおそれがある。また、前記導光体１１の端面は、何等処理がなされていないために光が洩れ易く、該導光体１１へ入射する入射光の光量に対する発光面からの出射光の光量が減少し、該発光面の輝度が低下するという問題点がある。

【０００７】本発明は、上記の事情に鑑みてなされたものであって、面内均一性に優れるとともに輝度の低下が小さく、しかも暗部やスジムラが生じるおそれのない発光面を有する標示装置を提供することを目的とする。

【０００８】

【課題を解決するための手段】上記課題を解決するために、本発明は次の様な標示装置を採用した。すなわち、請求項１記載の標示装置は、光源と、該光源に接続されて認識すべき図形または文字を標示する標示部とを備えており、該標示部は、少なくとも一端面が前記光源に対向する光入射面とされかつ一方の主面が粗面処理されて光出射面とされた導光体と、該一方の主面側に配置された光変向シートと、該光変向シートの外側に配置され認識すべき図形が形成された標示板とからなるものであり、前記導光体は、複数の小導光体を一つの面上に配列し、これら小導光体を弾性部材により外方から押圧して隣接する小導光体の端面同士を突き合わせた状態で保持したものである。

【０００９】この標示装置では、光源から出射する光は標示部内の導光体にその一端面から入射し、該導光体中を他端面に向かって伝搬し、導光体の一方の主面から外部に向かって所定の角度で出射する。ここでは、光源からの光を導光体中に誘導することによって、指向性の強い光が導光体中をその一端面から他端面に向かって僅かに減衰しつつ伝搬することになる。この光は光変向シートによりその光路が前記一方の主面に対して任意の方向へ修正され、標示板を通過する。

【００１０】ここでは、前記小導光体同士は常にその端面同士が突き合わされた状態で保持されることとなり、これら小導光体間や小導光体と該小導光体を保持する筐体との間に変形や隙間が生じるおそれがなくなる。これにより、発光面に該変形や隙間に起因する暗部が生じるおそれがなくなり、輝度の面内均一性が向上する。

【００１１】請求項２記載の標示装置は、前記光変向シートを、複数の小光変向シートの端面同士を透明部材を介して接合したものである。この標示装置では、小光変向シートの端面同士の接合が強固になるとともに、該接合部分の透明部材による輝度の低下も僅かなもので、輝度の面内均一性が低下することはない。

【００１２】請求項３記載の標示装置は、前記導光体の少なくとも一端面を鏡面としかつ該端面に反射膜を貼設したものである。この標示装置では、前記導光体の一端面における光の反射率が高まるので、発光面における輝度が向上する。これにより、同一光源を用いた場合においても、輝度を低下させることなく導光体を大型化することが可能となる。

【００１３】請求項４記載の標示装置は、前記導光体の他方の主面側に、該導光体から出射する光を反射させて再度該導光体に戻す反射体を設けたものである。この標示装置では、該導光体の一方の主面から出射する光の強度が強くなる。

【００１４】請求項５記載の標示装置は、前記導光体の一方の主面を平均傾斜角（θ_a）が０．５～２５°の凹凸面を有する梨地面とし、かつその輝度のバラツキ度（Ｒ％）を４５０％以下としたものである。この標示装置では、輝度の面内均一性が向上し、光出射面における輝度分布が均一になる。

【００１５】

【発明の実施の形態】以下、本発明に係る標示装置の一実施形態について図面に基づき説明する。図１は本発明の一実施形態の標示装置を示す一部破断平面図、図２は同縦断面図である。図において、符号３１は光源、３２は少なくとも一端面が光源３１に対向する光入射面とされかつ前面（一方の主面）が粗面処理されて光出射面とされた導光体、３３は導光体３２の前面（一方の主面）側に配置された光変向シート、３４は光変向シート３３の外側に配置され認識すべき図形が形成された標示板、３５は導光体３２の裏面（他方の主面）側に設けられ該導光体３２から出射する光を反射させて再度該導光体３２に戻す反射板（反射体）、３６は導光体３２をその面方向外方から押圧する圧縮コイルバネ（弾性部材）、３７は導光体３２と圧縮コイルバネ３６との間に設けられて該導光体３２を押さえる押さえ板、３８はハウジング（筐体）であり、導光体３２と、光変向シート３３と、標示板３４と、反射フィルム３５により標示部３９が構成されている。

【００１６】光源３１としては、一般に用いられる直管型の蛍光灯が好適に用いられるが、高速道路等のように交通を遮断して光源３１の交換作業を行う必要がある場合等においては、複数の光ファイバを並列に配置したラインライト等を用いてもよい。

【００１７】導光体３２は、複数（この実施形態では６枚）の小導光体３２ａ，…を水平面上に縦横に配列し、これら小導光体３２ａ，…を押さえ板３７，…を介して圧縮コイルバネ３６，…により外方から押圧して小導光体３２ａ，…の端面同士を突き合わせた状態で保持されている。

【００１８】小導光体３２ａ，…は、一端面が蛍光灯３１に対向する光入射面とされかつ前面（一方の主面）が粗面処理されて平均傾斜角（θ_a）が０．５～２５°の凹凸面を有する梨地面とされ、この梨地面が輝度のバラツキ度（Ｒ％）が４５０％以下の光出射面とされている。この小導光体３２ａ，…は、ガラス、合成樹脂等の透明板状体が好適に用いられる。前記合成樹脂としては、例えば、アクリル系樹脂、ポリカーボネート系樹

脂、塩化ビニル系樹脂等の高透明性の樹脂が好適である。これらの樹脂のうち、特にメタクリル酸メチルを主成分とするメタクリル樹脂が、透過率の高さ、耐熱性、力学的特性、成形加工性の点において優れている。

【００１９】粗面の形成方法としては、例えば、ガラスビーズ等の微粒子を吹き付けることにより粗面を形成したり、さらにフッ酸を用いた化学エッチングを施したガラス製、金属製の型を用いて、加熱プレス等により粗面を転写する方法、印刷法等により凹凸物質を塗布または付着させる方法、ブラスト法やエッチング法等により直接小導光体３２ａを加工する方法等がある。

【００２０】この導光体３２は、図３に示すように、光源３１に対向する端面を除いた３方向の端面４１にバフ磨き等の鏡面加工を施すことにより、表面粗さが８Ｓ以上の鏡面とされ、これらの端面４１に接着剤等を用いてリボン状の反射フィルム（反射膜）４２が貼設されている。この導光体３２では、端面４１を表面粗さが８Ｓ以上の鏡面とし、これらの端面４１に反射フィルム４２を貼設したので、端面４１における光の反射率が高まり、発光面における輝度が向上する。これにより、同一光源を用いた場合においても、輝度を低下させることなしに導光体３２を大型化することが可能である。

【００２１】この場合、粗面のままの端面４１に反射フィルム４２を貼設すると、端面４１周辺の発光面輝度が高くなり、発光面全体の輝度の均一性に欠けることとなり、また、端面４１を鏡面としたままで反射フィルム４２を貼設しないと、端面４１から光が洩れてしまい、光量が損なわれたままとなるうえに、端面４１からの光が明る過ぎて周辺部を改めて覆い隠す必要が生じ、不都合である。

【００２２】光変向シート３３は、導光体３２からの光の出射方向を、例えば法線方向等、特定方向へ変向させるためのもので、アクリル樹脂、ポリカーボネート樹脂、活性エネルギー線硬化型樹脂等からなり、シートの表面に多数のプリズム列が平行に形成されてプリズム面とされたプリズムシートの他、拡散シート、レンチキュラーレンズシート等の光学的に光の進路を変向させる光学素子が好適に用いられる。

【００２３】光変向シート３３は、前記導光体３２と同様、図４に示すように、複数の小光変向シート３３ａ，３３ａを水平面上に縦横に配列し、これら小光変向シート３３ａ，３３ａの端面同士を突き合わせ、この突き合わせ部に透明接着剤４４を介して透明添え板（透明部材）４５を貼設することにより、小光変向シート３３ａ，３３ａの平坦面同士が接合されている。この光変向シート３３は、上記構成の他、例えば図５に示すように、突き合わせ部に粘着剤付透明フィルム（透明部材）４７を貼設した構成としてもよい。この構成では、粘着剤付透明フィルム４７の厚みが薄いので、前記透明添え板４５を用いた場合と比べてフラットにすることができる。また、粘着剤付透明フィルム４７は、耐候性のある塩化ビニル等からなる透明フィルムが望ましい。

【００２４】この光変向シート３３により、導光体３２の前面から出射した法線に対して５０～８０°程度の指向性を持つ光を、任意の方向に光路を修正する。この場合、標示装置の使用目的によって異なるが、高速道路等の標示装置においては、導光体３２の前面の法線に対して下向きに概ね３～７°程度の角度となるように修正される。反射板３５は、ポリエチレンテレフタレート（ＰＥＴ）樹脂等からなるシート状の薄板の表面にＡｌ膜やＡｇ膜等が積層状態で蒸着されたもの等が好適に使用される。

【００２５】ここで、導光体３２の凹凸面を有する梨地面における光の屈折及び反射について説明する。図６に示すように、屈折率ｎの導光体３２の前面を凹凸の傾斜面からなる梨地面５１とし、光Ａが屈折率ｎの導光体３２から臨界角を越える入射角ｉで梨地面５１に入射し屈折率$n_{j'}$（～１）の空気中に出射角ｉ′で出射する場合を考える。

【００２６】梨地面５１に入射した光Ａは、スネルの法則（Snell's law）により

$$n \sim n / n_{j'} = \sin(i') / \sin(i) \quad \cdots\cdots (1)$$

を満足する出射角ｉ′で導光体３２の外方へ出射する。一方、臨界角内の入射角ｋで入射した光Ｂは、梨地面５１で角度ｋ′（ｋ′＝ｋ）で反射し導光体３２内を伝搬する。一旦、梨地面５１により反射された光は、再度梨地面５１に入射する際に入射角が鋭くなるため、臨界角を越え易くなり、導光体３２の外方へ出射し易くなる。

【００２７】本標示装置においては、ある点での光の出射強度（Ｉ）と光入射面端での出射強度（I_0）との関係は、出射率（α）、光出射面端からの距離（Ｌ′）および導光体の厚み（ｔ）を用いて式（２）により表されることが、本発明者等により実験的に見出されている。

$$I = I_0 (1 - \alpha / 100)^{L'/t} \quad \cdots\cdots (2)$$

（１）式から、導光体３２の長さ（Ｌ）と厚み（ｔ）が決定されれば、光出射面内における輝度の均一性が出射率（α）により決定されることがわかる。

【００２８】なお、厚みｔmmの導光体３２の出射率（α）は、導光体３２の光入射面端から２０mm間隔で輝度の測定を行い、該輝度の対数と光入射面端からの距離との関係からその勾配（Ｋ（mm^{-1}））を求め、この勾配（Ｋ）を次の（３）式に代入することにより求めることができる。

$$\alpha = (1 - 10^{K}) \times 100 \quad \cdots\cdots (3)$$

【００２９】本標示装置においては、輝度分布の均一性の尺度としてバラツキ度（Ｒ％）を用いる。バラツキ度（Ｒ％）は、導光体３２のほぼ中央部において光入射面端から２０mm離れた点から対向する端部までの範囲内の輝度を２０mm間隔で測定し、これらの輝度の最大値（I_{max}）、最小値（I_{min}）、平均値（I_{av}）を求め、これらの値を次の（４）式に代入することにより求めることができる。

$$R\% = \{(I_{max} - I_{min}) / I_{av}\} \times 100 \quad \cdots\cdots (4)$$

【００３０】以上の結果、導光体３２の出射率（α）とバラツキ度（Ｒ％）とは、導光体３２の長さ（Ｌ）と厚み（ｔ）に依存して特定の関係にあることがわかる。例えば、出射率（α）が大きくなると、バラツキ度（Ｒ％）もそれに伴って増加し、また、出射率（α）が一定であれば、導光体３２の長さ（Ｌ）と厚み（ｔ）の比（Ｌ／ｔ）が大きくなるに従ってバラツキ度（Ｒ％）も増加する。すなわち、一定の大きさの導光体３２においては、導光体３２の光出射面内での輝度分布の均一性（バラツキ度）は、導光体３２からの出射率（α）に依存するもので、出射率（α）を制御することにより輝度分布の均一性を図ることができる。

【００３１】また、導光体３２の梨地面５１を、近似的に１つの勾配を有する斜面とすると、導光体３２から出射する光の出射方向や出射率がこの凹凸の勾配に依存して変化する。前記勾配は、ＩＳＯ４２８７／１－１９８７に規定される平均傾斜角（θ_a）を用いて表すことができる。導光体３２からの出射光は、平均傾斜角（θ_a）が大きくなると出射角が小さくなり、法線方向に近づいた出射光となり、それに伴って導光体３２からの出射率も高くなる。したがって、導光体３２からの出射率を低くすることにより、該導光体３２の光出射面内での照度分布の均一性を高めることができ、平均傾斜角（θ_a）を小さくすれば均一化を図ることができる。

【００３２】本標示装置を高速道路や一般道路における案内標識や交通標識等において使用する場合、導光体３２の前面の梨地面の輝度のバラツキ度（Ｒ％）が４５０％以下であれば、要求される輝度分布の均一性を満足することができる。このためには、前記梨地面の平均傾斜角（θ_a）を０．５～２５°、好ましくは０．５～７．５°とすることが必要である。その理由は、平均傾斜角（θ_a）が０．５°未満であると、光出射面からの出射光の出射角が大きくなり、光変向シート３３を用いても該出射光を十分法線方向へ向けることができなくなるからであり、一方、平均傾斜角（θ_a）が２５°を越えると、輝度分布の均一性が損なわれるからである。

【００３３】以上説明したように、本実施形態の標示装置によれば、導光体３２を、複数の小導光体３２ａ，…を水平面上に縦横に配列し、これら小導光体３２ａ，…を押さえ板３７，…を介して圧縮コイルバネ３６，…により外方から押圧して小導光体３２ａ，…の端面同士を突き合わせた状態で保持する構成としたので、小導光体３２ａ，…同士を常にその端面同士を突き合わせた状態で保持することができ、これら小導光体３２ａ，…間や小導光体３２ａと該小導光体３２ａを保持するハウジング３８との間に変形や隙間が生じるのを防止することができる。したがって、発光面に該変形や隙間に起因する暗部が生じるおそれがなく、輝度の面内均一性を向上させることができる。しかも、小導光体３２ａ，…を水平面上に縦横に配列することにより、大面積の面光源素子の実現が可能になり、設計の自由度が増加する効果がある。

【００３４】また、小光変向シート３３ａ，３３ａの端面同士を突き合わせ、この突き合わせ部に透明添え板４５または粘着剤付透明フィルム４７を貼設したので、端面同士の接合を強固にすることができ、しかも輝度の面内均一性が低下することもない。また、構造が簡単であるから、容易に製作することができる。

【００３５】また、導光体３２の端面４１を表面粗さが８Ｓ以上の鏡面とし、これらの端面４１に反射フィルム４２を貼設したので、端面４１における光の反射率を高めることができ、発光面における輝度を向上させることができる。したがって、輝度を低下させることなしに導光体３２を大型化することができる。

【００３６】また、導光体３２の裏面側に反射板３５を設けたので、該反射板３５により該導光体３２から出射する光を反射させて再度該導光体３２に戻すことができ、該導光体３２の出射光の光強度を増大させることができる。

【００３７】また、導光体３２の前面を平均傾斜角（θ_a）が０．５～２５°の凹凸面を有する梨地面とし、かつその輝度のバラツキ度（Ｒ％）を４５０％以下としたので、輝度の面内均一性を向上させることができ、光出射面における輝度分布を均一にすることができる。

【００３８】

【発明の効果】以上説明した様に、本発明の請求項１記載の標示装置によれば、前記導光体は、複数の小導光体を一つの面上に配列し、これら小導光体を弾性部材により外方から押圧して隣接する小導光体の端面同士を突き合わせた状態で保持する構成としたので、小導光体同士を常にその端面同士を突き合わせた状態で保持することができ、これら小導光体間や小導光体と該小導光体を保持する筐体との間に変形や隙間が生じるのを防止することができる。したがって、発光面に該変形や隙間に起因する暗部が生じるおそれがなく、輝度の面内均一性を向上させることができる。

【００３９】請求項２記載の標示装置によれば、前記光変向シートを、複数の小光変向シートの端面同士を透明部材を介して接合したので、端面同士の接合を強固にすることができ、しかも輝度の面内均一性が低下すること

もない。

【００４０】請求項３記載の標示装置によれば、前記導光体の少なくとも一端面を鏡面としかつ該端面に反射膜を貼設したので、端面における光の反射率を高めることができ、発光面における輝度を向上させることができる。したがって、輝度を低下させることなしに導光体を大型化することができる。

【００４１】請求項４記載の標示装置によれば、前記導光体の他方の主面側に、該導光体から出射する光を反射させて再度該導光体に戻す反射体を設けたので、該反射体により該導光体から出射する光を反射させて再度該導光体に戻すことができ、該導光体の出射光の光強度を増大させることができる。

【００４２】請求項５記載の標示装置によれば、前記導光体の一方の主面を平均傾斜角（θ_a）が０．５～２５°の凹凸面を有する梨地面とし、かつその輝度のバラツキ度（Ｒ%）を４５０%以下としたので、輝度の面内均一性を向上させることができ、光出射面における輝度分布を均一にすることができる。

【図面の簡単な説明】

【図１】本発明の一実施形態の標示装置を示す一部破断平面図である。

【図２】本発明の一実施形態の標示装置を示す縦断面図である。

【図３】本発明の一実施形態の標示装置の導光体の構成を示す分解斜視図である。

【図４】本発明の一実施形態の標示装置の小光変向シートの接合構造を示す図であり、同図（ａ）は平面図、同図（ｂ）は側面図である。

【図５】本発明の一実施形態の標示装置の小光変向シートの他の接合構造を示す図であり、同図（ａ）は平面図、同図（ｂ）は側面図である。

【図６】本発明の一実施形態の標示装置の導光体の粗面における光路を示す模式図である。

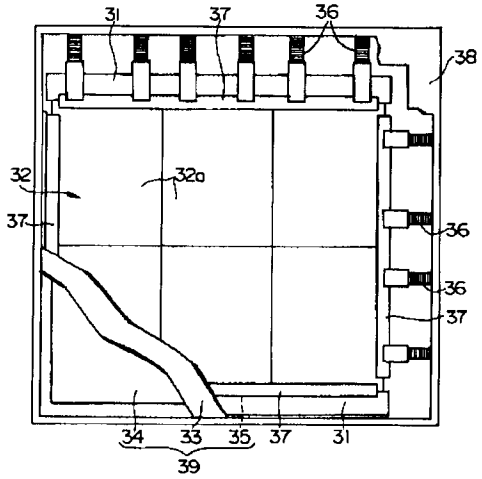
【図７】従来の標示装置を示す概略構成図である。

【図８】従来の標示装置を示す部分斜視図である。

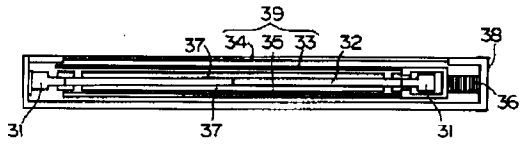
【符号の説明】

３１　光源
３２　導光体
３２ａ　小導光体
３３　光変向シート
３３ａ　小光変向シート
３４　標示板
３５　反射板（反射体）
３６　圧縮コイルバネ（弾性部材）
３７　押さえ板
３８　ハウジング（筐体）
３９　標示部
４１　端面
４２　反射フィルム（反射膜）
４４　透明接着剤
４５　透明添え板（透明部材）
４７　粘着剤付透明フィルム（透明部材）
５１　梨地面

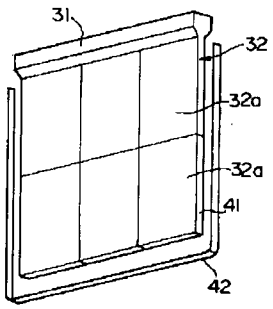
【図１】



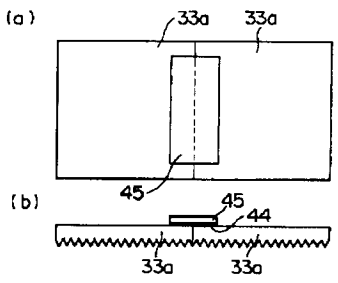
【図２】



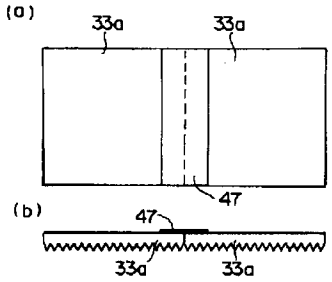
【図３】



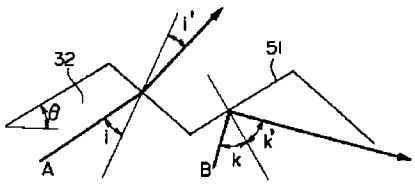
【図４】



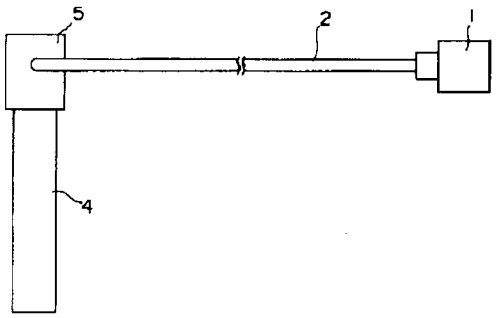
【図５】



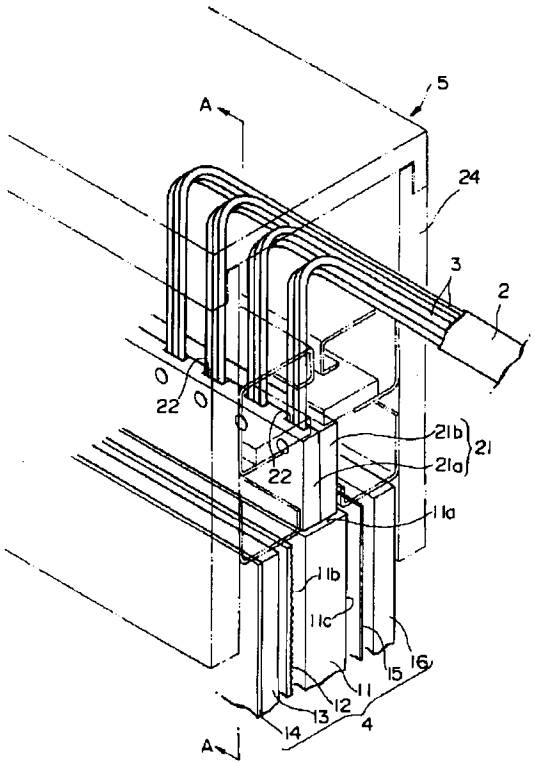
【図６】



【図７】



【図８】



フロントページの続き

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